

**Systems Game Workshop**  
**Facilitator: Abigail Lynam**  
**Storming the Sound – March, 2012**

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— Terri Carta, Manager of Community Partnerships and Programs at Central Park Conservancy; ETL Online Alumna

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## **Criteria of Systems Thinking**

By Fritjof Capra – Center for Ecoliteracy

### **FROM THE PARTS TO THE WHOLE**

In order to understand the principles of ecology, we need to think systemically. Living systems are integrated wholes whose properties cannot be reduced to those of smaller parts. Their “systemic” properties are properties of the whole, which none of the parts have. Thus systems thinking implies a shift of thinking from parts to whole.

### **FROM OBJECTS TO RELATIONSHIPS**

Ecology deals with relationships that interlink all members of an ecological community. The study of ecology is very essentially, a study of relationships, which is also true of systems theory. In the systems view, the objects themselves are networks of relationships, embedded in larger networks. To understand the whole, we have to understand the relationships between the parts. Thus the shift of thinking from the parts to the whole is also a shift from objects to relationships.

### **FROM OBJECTIVE KNOWLEDGE TO CONTEXTUAL KNOWLEDGE**

The shift of focus from the parts to the whole implies a shift from analytical thinking to contextual thinking; from objective knowledge to contextual knowledge. The properties of the parts are not intrinsic properties but can be understood only within the context of the larger whole. Thus systems thinking is “contextual” thinking and since explaining things in terms of their context means explaining them in terms of their environment, all systems thinking is environmental thinking.

### **FROM CONTENTS TO PATTERNS**

In studying relationships, it becomes apparent that the same kinds of relationships appear repeatedly in living systems. There is a pattern; a configuration of relationships that appears repeatedly. Systems thinking, therefore, means thinking in terms of patterns. Instead of focusing on what a living system is made of (the contents) we ask for its patterns.

### **FROM QUANTITY TO QUALITY**

The study of pattern, or of form, is the study of quality, which requires mapping and visualizing. Form and pattern cannot be measured and weighed; they must be visualized. Thinking in terms of pattern implies a shift from quantity to quality. This very important aspect of studying pattern is the reason why, every time the study of pattern has been in the forefront, artists have contributed significantly to the advance of science.

### **FROM HIERARCHIES TO NETWORKS**

The most important and the most general pattern in a living system is the network. Thinking in terms of networks is another characteristic of the theory of living systems. In social organizations, this is expressed as a shift from hierarchies to networks.

### **FROM STRUCTURE TO PROCESS**

Living form is more than a shape, more than a static configuration of components in a whole. There is a continual flow of matter through a living system, while its form is maintained; there is development, and there is evolution. Thus the understanding of living structure is inextricably linked to the understanding of metabolic and developmental processes. Systems thinking includes a shift of emphasis from structure to process.

Ways of the System Thinker: Linda Booth Sweeney

- Sees the whole picture
- Changes perspectives to see new leverage points in complex systems
- Looks for interdependencies
- Considers how mental models create our futures
- Pays attention and gives voice to the long-term
- “goes wide” peripheral vision to see complex cause and effect relationships
- Finds where unanticipated consequences emerge
- Lowers the water line to focus on structure not blame
- Holds the tension of paradox and controversy without trying to resolve it

#### **1<sup>st</sup> exercises: Awareness of our thinking and how it operates**

Give everyone a sheet of paper – write down a color, piece of furniture and a flower

More often than not you get red, chair & rose OR blue, couch & daisy

Neurological pathways – mind gets in a groove

#### **2<sup>nd</sup> Exercise: List of word associations**

Slumber                      pillow

Dream                        night

Bed	blanket
Quiet	pajamas
Nap	snooze

Show the list – then take list away and have them write down all the words they remember from the list.

Now ask – how many wrote down slumber? How many wrote down night? How many wrote down sleep? Now show them the list.

How do we develop the observer in ourselves so we have our thoughts instead of them having us?

How do we become aware in real time our associations?

### **3<sup>rd</sup> Exercise - Arms Crossed**

Have group fold their arms as if you were bored. One arm naturally falling on top of the other. Look at your arms and notice which one is on top. Feel how this feels. Does it feel normal to you?

Now ask them to fold their arms the other way – with the other arm on top. How does that feel – Not normal.

Describe that this is how the brain reacts when there is new mental stimulus. We have so many ruts and grooves in our brain and this has just asked you to step out of the habit of what you usually do.

How does our needing to feel comfortable get in the way of our learning? Researchers suggest the time of our greatest growth is when we step out of our comfort zone.

### **4<sup>th</sup> Exercise: Circles in the Air**

Explore the possibility that our viewpoint depends upon where we “sit” and discover new leverage points in complex systems. You can hold completely different perspectives of the same system.

Take the pencil and hold it straight up and draw a circle on the ceiling in a clockwise position. Tell them to keep drawing the circle looking up – now have them slowly bring it down until you are looking down on it – never changing the direction that you are going. Ask the group now – What direction is the pen going now?

So what happened?

Their vantage point is what changed the direction of the pen. The pen didn't change.

What were your first reactions?

Do your immediate reactions provide any insight into your own process of forming assumptions?

Have we yet to find the language for the concept of multiple vantage points in complex systems?

Donella Meadows asks: How is it that one way of seeing the world becomes so widely shared that institutions, technologies, production systems, buildings, cities become shaped around that way of seeing? How do systems create cultures?

We tend to blame ourselves for not doing it right... we are confused by the exercise.

### **5<sup>th</sup> Exercise – Thumb Wrestling**

To show our mental models – our deeply held beliefs about how the world works – are often transparent and directly affect the actions we take. It is about exploring our implicit assumptions about competition.

Find partner, ask them if they have thumb wrestled, demonstrate if necessary. Goal is collect as many points as possible in one minute.

What was your mental model about thumb wrestling? How can we shift our thinking from competition to collaboration?

### **6<sup>th</sup> Exercise: Group Juggle**

Get in a circle. An object is thrown around the group with the two rules below.

Two rules: Everyone must touch the object once and they must be touched in the same human sequence.

You have them practice and get their sequence – then you have them decide how fast they can do it. You time them. Then you challenge them to cut the time in half. When they try to bend the rules, tell them that the rules again. Keep clear the two rules. Variation – you can introduce two objects, or three.

You can throw in a challenge by saying that other groups that I have worked with have done it in much less time.

Groups cut the time down but they reach a limit – they can't do it any faster. Efforts to solve the problem may increase but the time doesn't get better.

Limiting Factor: They are stuck in the same approach. They can't get out of thinking it has to be a certain way. How did the group get out of it? What happened?

The fast time is actually achieved by not passing the ball around ... but lining up or in fact putting the object in the middle and everyone in turn touches it quickly.

### **Shifting to Cooperation:**

### **7<sup>th</sup> Exercise: Lowering the pole**

Have a group line up in two lines. Give them a pole and they have to hold it head high with each person only using one finger under the pole to support it.

They are instructed to not talk, but to lower the pole to the ground as a group without dropping the pole. Set them free to do it.

What happened? Discuss the ways in which cooperation was communicated or felt as they worked to do this. How did it feel?

### **8<sup>th</sup> Exercise: Systems Game to show interdependence**

Have everyone get in a circle and without telling anyone their choice, pick two people in the group. The next direction is that the group is going to start moving randomly but each person's task is to stay equal distance from their two people – not between them necessarily but equal distance away. They have to keep adjusting their position based on the people. Stop when you are equal distance. Sometimes groups come to a balance – sometimes they don't in which case you can stop the group.

What happened – cause and effect. Balancing loops, reinforcing loops.

Variation: Have people hold hands up on each side of their eyes so they have limited vision.

Discuss what people gained from the experience.

### **9<sup>th</sup> Exercise: Exponential**

Everyone is given a piece of paper with a number on it. All the papers have 1 on them but there is one piece of paper that has two. They are instructed to not let anyone know their number but to start milling and go up to a person and whisper their numbers to each other. The person who has the higher number, the person with one will now take on that number. Each time thereafter they will speak with their higher number. After 30 seconds – or a minute depending on the size of the group, you ask them to stop. Have all the two's go to one side. Look at who remains a one. Then ask who started out as a one. Most of the crowd. So a discussion about how exponential works and how quickly it works. How is exponential afoot in our world? How do we really experience exponential? It is a silent process at work. What kinds of balancing loops need to be designed to keep exponential from causing collapse? You reach equilibrium at some point and cannot go any further.

### **10<sup>th</sup> Exercise: The role of communication in systems function**

Pass everyone a piece of paper. The rules are: No talking. Participants must close their eyes. They need to follow the direction that the facilitator gives. The goal is to produce identical patterns with their pieces of paper.

The facilitator reads the following directions: Fold your paper in half. Tear off the bottom right hand corner of the paper. Pause and allow the group to do this. Fold the paper in half again and tear off the upper right hand corner. Pause. Fold the paper in half again and tear off the lower left hand corner.

Pause. Open your eyes and unfold your paper and hold it out for the group to see.

Compare results. What is happening?

Ask the group to form a group of three – give them another piece of paper and one person leads out and can make up what they want them to do keeping the directions purposely simple. Three steps involving a fold and tear.

Do it again only this time allow the listeners to talk.

Have them discuss how the listening and communicating went. What are the implications for systems function in terms of communication and listening?

### **11<sup>th</sup> Exercise: Framing the situation - your own google map**

Have group put their arm out full length in front of their face and ask them to make a small hole with the thumb and fingers. One they can look through. Now give them an object to look at... something in the room, or something you are doing in a chair at the front of them. Have them focus on your pen writing.

What do you see in the frame?

What questions could you answer with the information available to you through the frame?

Who might be interested in the data you are collecting?

What actions could you take to influence the objects or the processes that you see?

Now have them move their arms half way to their face broadening the view through their finger hole.

Ask the same set of questions.

Now have them put the finger hole right at their eye and look again at the object and ask them to tell you what they see now.

Point out that object remained the same during their three different inspections. Ask them whether their responses to the questions changed. Why did they change? What was the best perspective?

What perspective most interests you?

How do you know that your coworkers hold the same perspective? Is there value in each perspective? Does the time that we take to observe make a difference? Is the frame more important than what you see? How does this relate to time? Closer up view is present, farther view is from bigger time frame.



Resources:

[www.centerforecoliteracy.org](http://www.centerforecoliteracy.org)

The Systems Thinking Playbook. Linda Booth Sweeney & Dennis Meadows, Exercises to Stretch and build Learning and System Thinking Capabilities, 1995. Sustainability Institute, 3 Linden Road, Harland, VT 05048.

When A Butterfly Sneezes, Linda Booth Sweeney. A Guide for Helping Kids Explore Interconnections in Our World Through Favorite Stories. Pegasus Communications, 2001.

Thinking in Systems: A Primer. Donella H. Meadows. Ed. Dinan Wright. Sustainability Institute. 2008. Chelsea Green Publishing.

Some Children's Books to Promote Systems thinking:

Trout Are Made of Trees – April Pulley Sayre

Seven Blind Mice – Ed Young

If you Give a Moose a Cookie – Laura Joffe Numeroff

The Old Ladies Who Liked Cats – Carol Greene

Anno's Magic Seeds – Mitsumasa Anno

Zoom – Istvan Banyai

A River Ran Wild – Lynne Cherry

The Butter Battle Book – The Lorax – Sneetches – The Cat in the Hat Come Back - Dr. Seuss (any of his books have systems learning in them)

Tree of Life – The world of the African Baobab – Barbara Bash

Who Speaks for Wolf – A Native American Learning Story